

POLYNOMIALS WITH COMPLEX ROOTS

A) Solving by completing the square:

1) Solve $x^2 + 6x + 15 = 0$.

$$\begin{aligned}x^2 + 6x + 15 &= 0 \\x^2 + 6x &= -15 \\x^2 + 6x + \left(\frac{6}{2}\right)^2 &= -15 + \left(\frac{6}{2}\right)^2 \\x^2 + 6x + 9 &= -15 + 9 \\(x + 3)^2 &= -6 \\x + 3 &= \pm\sqrt{-6} \\x &= -3 \pm \sqrt{6i^2} \\x &= -3 + \sqrt{6}i, -3 - \sqrt{6}i\end{aligned}$$

2) Write the original equation in factorised form.

$$\begin{aligned}(x - (-3 + \sqrt{6}i))(x - (-3 - \sqrt{6}i)) &= 0 \quad \text{or simplified to} \\(x + 3 - \sqrt{6}i)(x + 3 + \sqrt{6}i) &= 0\end{aligned}$$

B) Solving using the quadratic formula:

1) Solve $x^2 + 4x + 13 = 0$.

$$\begin{aligned}x &= \frac{-4 \pm \sqrt{4^2 - 4(1)(13)}}{2(1)} \\x &= \frac{-4 \pm \sqrt{-36}}{2} \\x &= \frac{-4 \pm \sqrt{36i^2}}{2} \\x &= \frac{-4 \pm 6i}{2} \\x &= -2 \pm 3i \\x &= -2 + 3i, -2 - 3i\end{aligned}$$

2) Write the original equation in factorised form.

$$\begin{aligned}(x - (-2 + 3i))(x - (-2 - 3i)) &= 0 \quad \text{or simplified to} \\(x + 2 - 3i)(x + 2 + 3i) &= 0\end{aligned}$$

Delta Ex 31.2 pg 285 – 286

Delta Ex 31.3 pg 286 – 287